Use cases of ‘Internet of Things’ that facilitate sustainable development goals

A case study by Group 7

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IoT

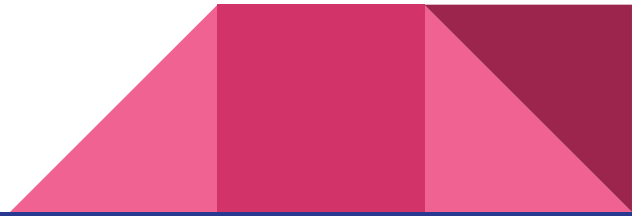
Internet of Things

- What is IoT?
- Why IoT?
- IoT in sustainable development

What is IoT?

- IoT is a system of devices connected to Internet with the ability to connect and exchange data from users and environment.

- The device or the thing in the could be any device embedded with electronic, software and sensor like a smart refrigerator, a smart AC, smart TV, smart watch, lights in house hold, connected security systems or even a person with heart monitor or an automobile



Why IoT?

- We want to **automate** everything
- We want to **control** everything remotely
- We want the data to be updated in **real time.**
- Why is the impact of IoT so large? At its core, IoT is about measuring and remotely controlling previously unconnected “things”. It reaches people and objects that older technology could not.

What are SDG's?

- First of all, what's sustainable? The ability to uphold something, in this scenario we are talking about development.
- Sustainable development goals can be termed as a blueprint to achieve a better and more sustainable future for all.
- Huge orgs like the UN adopted this in 2015.
- The UN adopted sdgs, their main intention is to end poverty, protect the planet and ensure that each and every person on this planet in 2030 has peace and prosperity.
- There are 17 sdgs.These are connected with each other.


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

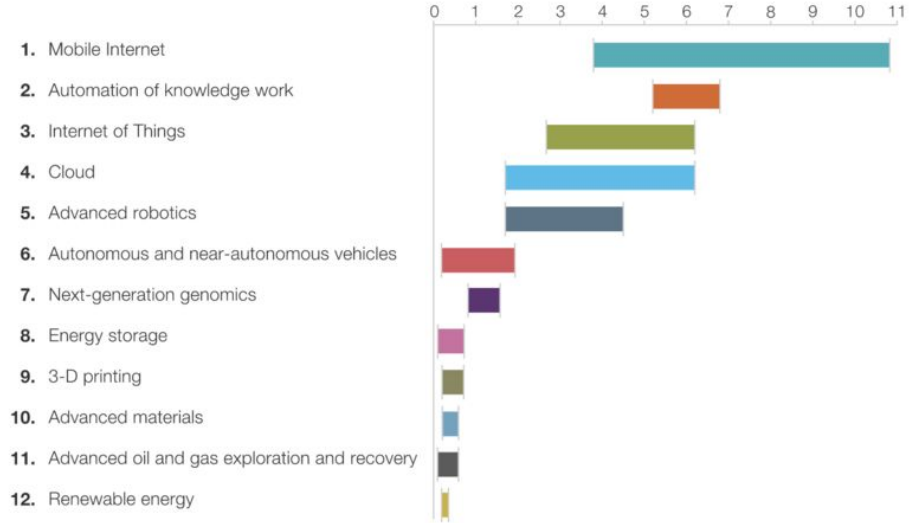
17 SDGs

Effect Of IoT on Sustainability

- Technology has driven global prosperity for centuries. Unfortunately, it has brought severe side effects
  Eg: CO_2 emissions, Water Pollution, Poor Mental Health.
- We have to use clean energy like (sun, wind).
- Many org like tesla are standing with development with sustainable energy, elon musk says CO_2 reduction is a key goal.
- The **Internet of Things** (IoT) is a **key** focus.

A gallery of **disruptive technologies**

Estimated potential economic impact of technologies across sized applications in 2025, $ trillion, annual



SOURCE: McKinsey Global Institute

Notes on sizing: These economic impact estimates are not comprehensive and include potential direct impact of sized applications only. They do not represent GDP or market size (revenue), but rather economic potential, including consumer surplus. The relative sizes of technology categories shown do not constitute a "ranking," since our sizing is not comprehensive. We do not quantify the split or transfer of surplus among or across companies or consumers, since this would depend on emerging competitive dynamics and business models. Moreover, the estimates are not directly additive, since some applications and/or value drivers are overlapping across technologies. Finally, they are not fully risk- or probability-adjusted.

It is one of the 3 most impactful technological advancements we will see before 2030, acc to McKinsey. By 2025, the IoT's economic impact will be around **$11.1 trillion - 14%** of today's global GDP

According to the Mckinsey's research

- Most current IoT projects can contribute to achieving both the SDGs and the UN's 2030 mission.
- Most of existing IoT deployments can address the SDGs.
- Most projects concentrate on these SDGs:
  - #7 Affordable and clean energy
  - #3 Good health and well-being
  - #9 Industry, innovation, and infrastructure
  - #11 Smart cities and communities
  - #12 Responsible production and consumption
  - #16 Peace Justice and strong institutions
  - #14 life below water
  - #6 clean water and sanitation

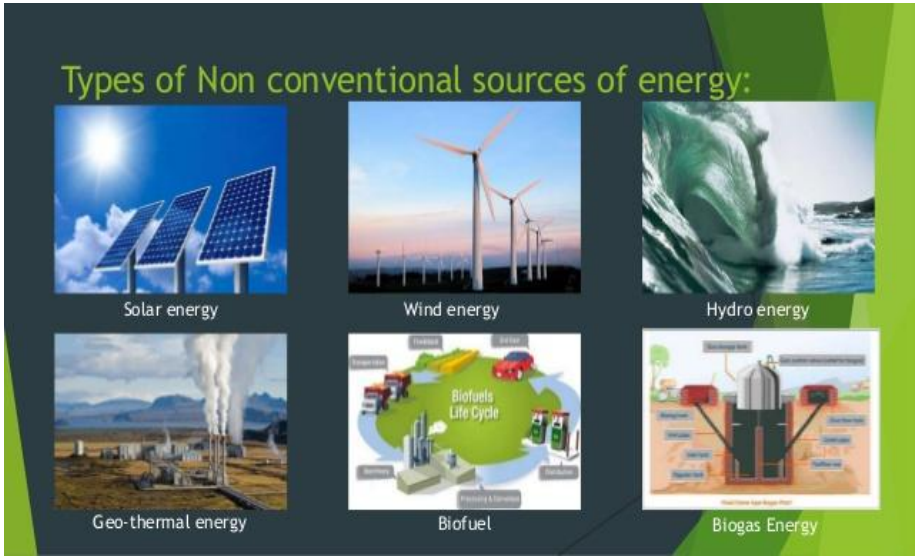
Affordable And Clean Energy

- SDG - 7

7 AFFORDABLE AND CLEAN ENERGY

About SDG - 7

- Ensure access to affordable, reliable, sustainable and modern energy for all



Challenges

Opportunities

Energy is critical and people with no sustainable access to energy are deprived of the opportunity to become part of national and global progress.

Access

One billion people around the world live without access to energy.

Technology

39% of the world's population, do not have access to clean fuels and technologies for cooking.

Use Cases of IOT

- Internet of Things is the enabler of the modern energy industry.
- **Control and automation** - Automate the management of wind farms, optimize maintenance, thus reduce the cost dramatically.
- **Availability** - Watttime system is a good example of an IoT solution that makes green energy available to everyone.
- **Cost - Efficiency** - Power consumption monitoring and control tools that eventually help them cut down on the use of electricity and save big money

Steps taken by Indian Government

- The government's National Solar Mission is playing an important role in the work towards renewable energy, and interventions in rural electrification.

- New ultra-mega power projects are moving India towards achieving universal energy access.

- Some of the government schemes that are taken are listed below.
  - Scheme to Support Promotion Of Biomass Based Cogeneration In Sugar Mills And Other Industries In The Country (Up To March 2020)

  - Programme on Energy from Urban, Industrial, Agricultural Wastes/ Residues and Municipal Solid Waste

Role of ICT

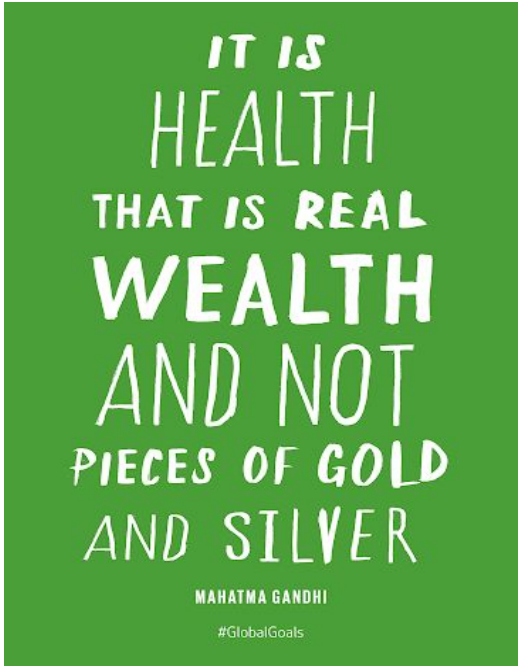
- ICT's can help accelerate progress towards each of the 17 SDGs.
- The International Telecommunication Union (ITU) is a specialized agency responsible for all matters related to ICT's.
- ITU strategy is to leverage the power of ICTs to accelerate progress on the SDGs
- It has helped develop greener ICTs and has outlined how smart grids can help to build more controllable and efficient energy systems and reduce carbon emissions.

Good Health And Well-Being

- SDG - 3

About SDG - 3

- Ensure healthy lives and promote well-being for all at all ages.



Challenges

Deaths

Despite global progress, an increasing proportion of child deaths occur in sub-Saharan Africa and Southern Asia.

Access

Universal affordable access to healthcare remains a challenge

Child Dispatchers

Over the years, significant strides have been made in increasing life expectancy and reducing some of the common killers associated with child and maternal mortality.

Use Cases of IOT

- The COVID-19 pandemic has been a pivot for exponential growth of IoT in healthcare.

- Telemedicine: From NASA's Mercury Program to COVID-19.
  - Telemedicine is an enabler in providing remote care especially in geographically remote areas.
  - The recent COVID-19 pandemic has shown the usefulness of telemedicine consultation in breaking the cycle of infection spread and easy access to consultation.

- Making Hospitals Smart-Management of Hospital Assets and Workflows.
  - Hospitals can be viewed as asset and information intensive organisations.

Steps taken by Indian Government

- The Indian government's National Health Mission prioritises national wellbeing and is leading change in this area

- India has made some progress in reducing its under-five mortality rate.

- Some of the government schemes that are taken are listed below.
  - Janani Shishu Suraksha Karyakram (JSSK)
  - Rashtriya Bal Swasthya Karyakram(RBSK)

Role of ICT

- Direct patient interaction, health informatics and telemedicine can be improved through better connectivity.

- In 2017, ITU and the World Health Organization launched the “Digital Health for Africa” partnership to scale up the use of digital technologies to strengthen the delivery of public health care services in Africa.

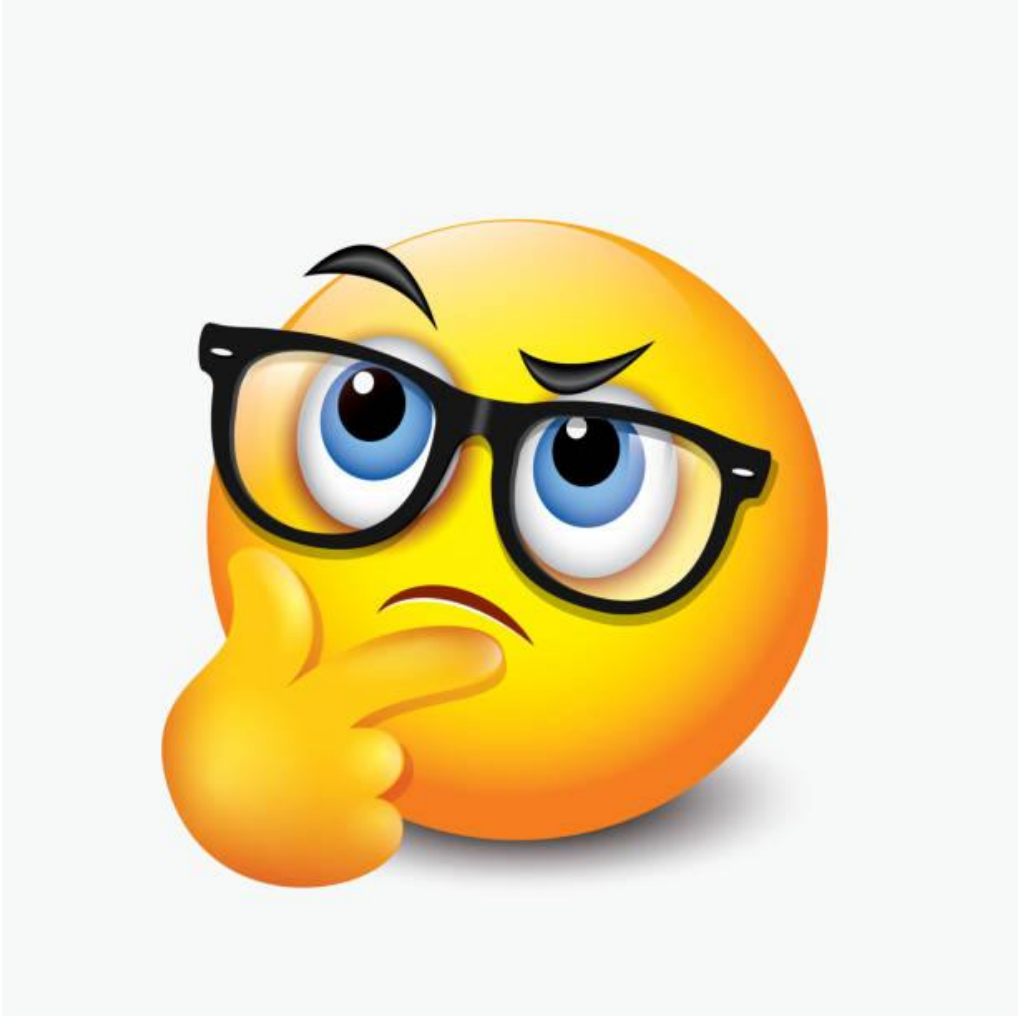
- ITU is also developing standards for multimedia systems to support the widespread deployment of e-health applications.

SUSTAINABLE DEVELOPMENT GOALS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

SDG 9



WHY IOT HERE ?

SUSTAINABLE DEVELOPMENT GOALS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALISATION, AND FOSTER INNOVATION

GLOBALLY

14.2%

OF THE WORLD'S WORKFORCE EMPLOYED IN MANUFACTURING

1.1 MANUFACTURING JOB CREATES 2.2 JOBS IN OTHER SECTORS

IN INDIA

111

MILLION

PEOPLE EMPLOYED IN MICRO, SMALL AND MEDIUM ENTERPRISES PRODUCE

33%

OF THE MANUFACTURING OUTPUT

GDP GROWTH AVERAGED

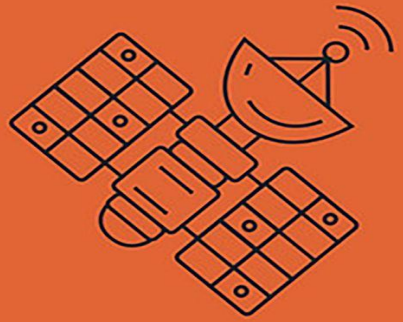
7.2%

BETWEEN 2018 - 2019

566

MILLION INTERNET SUBSCRIBERS (MOBILE AND LANDLINE)

1.80 MT ONE OF THE LOWEST PER CAPITA CO2 EMISSIONS IN THE WORLD



MANGALYAAN IS THE WORLD'S LEAST EXPENSIVE INTERPLANETARY MISSION TO MARS

Why we need IOT here ?

- Industry 4.0 gaining popularity
- Big data , data analytics and digital technology is going to play important role.
- To increase efficiency
- To improve quality of products and services
- To reduce cost

USE CASES

- Predictive maintenance : able to determine when piece of equipment will fail before it does.
- Smart metering
- Asset Tracking
- Fleet management : for companies relying on transportation

Indian Government Initiatives

- Government will fund exhibition space cost (up-to 80% funding) to 1000 Indian SMEs (Small and Micro Enterprises) who are well credit rated by National Small Industries Corporation/ MSME and, are contributing to IoT industry of India and need international exposure to promote their products at international exhibitions and for study tours, subject to a maximum of Rs.6 lakhs per Enterprise per year.
- Government will also fund (up-to 100%) IoT specific study tours by Industry Associations and supporting government organizations. 13 We recommend that government should support the above mentioned initiatives through programs owned by Ministry of MSME.

Indian Government Initiatives

- The Centre of Excellence (CoE) for Internet of Things (CoE-IoT) will host IoT incubation infrastructure to support start-ups, SMEs, students and other innovators based on membership and support from design to prototype in productizing their ideas.
- The CoE-IoT will be set up in major cities for Internet of Things innovation housing hardware design tools, wireless development kits, application sensors, software tools, training on specific technologies, industry interface etc. that otherwise would be difficult to afford for the start-ups, democratizing the innovation process.
- The industry liaisoning will be the responsibility of an industry partner NASSCOM, while ERNET will provide the academic interfacing.

Challenges

- Interoperability
- Reliability
- Security
- Network Performance
- Scalability
- Management

Role of ICT

SDG 9

- Infrastructure is controlled, managed and optimized by ICTs
- making cities smarter and more sustainable to improve quality of life
- increase in productivity , highly depends on the effective use of ICTs


GOAL
11
#SDGs
SUSTAINABLE CITIES
AND COMMUNITIES
Make cities and human settlements inclusive, safe,
resilient and sustainable

SDG 11

Challenges

Challenge 1

By 2030,

1) More than 4.2 billion people lives in cities.
2) 43 megacities with each more than 10 million inhabitants.

Challenge 2

By 2030,

1) 60-80% all energy Consumption.
2) 75% of planet's carbon emissions.

Challenge 3

1) experiencing congestion, a lack of basic services, a shortage of adequate housing, and declining infrastructure

Why is this Important ?

SDG 11

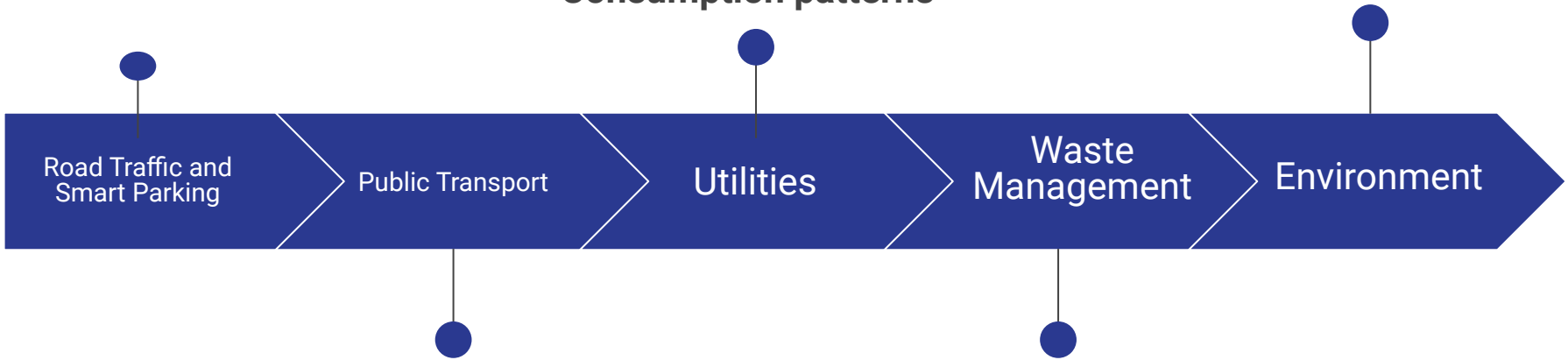
- Cities are engines for sustainable development.
- Opportunities for people in urban spaces.
- Urban areas emmits lot of greenhouse gases and contribute to climate change.

IoT Use cases for Smart Cities

Sensors-fetch GPS data,Smart Traffic lights(Cloud),Closed Circuit Television cameras.

Smart meters and Billing, Revealing Consumption patterns

Network of Sensors along busy roads and around plants to check air quality.



Retrieve data from IoT sensors to enhance travelling experience.

Each waste container gets a sensor that gathers the data about the level of the waste in a container.

Indian Government Initiatives

Smarts Cities Mission

- Launched on 25th june 2015 by hon' prime minister.
- 100 cities have been selected for developing as smart cities.
- Participation of private sector through Public private partnerships.

Awas Yojana

- Launched on 25th june 2015 by hon' prime minister.
- to provide housing for all in urban areas by year 2022.

AMRUT Scheme

- To ensure a proper supply of water and a sewage connection in every household.
- Latest developments includes sewage treatment plans(STPS),Online building permission system.

Role of ICT

SGD 11

- ICT has a crucial role in sustainable smart cities.
- ICT-enabled information and knowledge sharing.
- ICT-enabled forecasts.
- ICT-enabled integration.

Responsible Consumption and Production

- 12 SDG

What does SDG-12 do?

- use of natural resources
- food waste reduction through prevention
- reduction , recycling and reuse
- environmentally sound management of chemicals

Challenges deep-dive

Globally

- By 2050 , if population becomes 9.6 billion(approx),an equivalent of 3 planets will be required to sustain current life style
- Energy use doubled since 2000.
- 1/3rd of food produced is wasted.
- energy use in OECD countries will increase a further 35% by 2020.

India

- 3rd largest Green House Emitter responsible for 6.9% of global emissions.
- Only 19.9% of urban Indian’s waste is processed.

Indian Government Initiatives

- In year 2015 , india decided to reduce emission intensity

20-25 % by 2020

33-35% by 2030

- The government formally ratified the historic Paris Agreement.

On 2nd October 2016

- The National Policy On Biofuels and National Clean Energy Fund are some of government flagship schemes.

Use cases of IoT

1. **Monitoring of climate conditions :** allMETEO, Smart Elements, and Pycno.
2. **Greenhouse automation :** Farmapp ,Growlink and GreenIQ.
3. **Crop management :** Arable and Semios
4. **Cattle monitoring and management :** SCR by Allflex and Cowlar
5. **Precision farming :** CropX
6. **Agricultural drones :** SoilScout
7. **Predictive analytics for smart farming :** FarmLogs and Cropio.

IoT shaping agriculture

1. Data, tons of data, collected by smart agriculture sensors
2. Better control over the internal processes and, as a result, lower production risks
3. Cost management and waste reduction thanks to the increased control over the production.
4. Increased business efficiency through process automation.
5. Enhanced product quality and volumes

Govt sponsered schemes

- Daily Enterpreneurship Developement scheme
- Commercial production units for govt inputs.
- National livestock mission
- Intrest subvention scheme
- GSS- Ensuring end used of subsidy released.

Role of ICT

- Improves product specific improvements
- Increased Dematerialization
- Virtualisation
- Smart technologies
- Cloud computing , smart grids,smart metering, and reduced energy consumption has an impact on reducing the consumption.

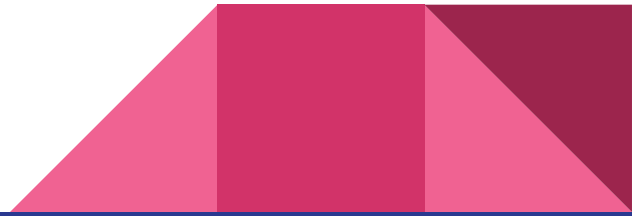
Peace, Justice and Strong Institutions

- 16 SDG

IoT in India’s Defence Sector

Why we need IoT in defense sector?

- Gather Battlefield awareness
- Proactive health surveillance
- Augmented Reality Remote Training
- and many more



According to the Indian IoT Magazine,Two startups are making remarkable progress in IoT based solutions in defence sector

1. Tonbo Imaging
2. CRON Systems

Tonbo Imaging

- Tonbo specializes in imaging technology, especially thermal imaging, which provides enhanced vision in low-light conditions using heat signatures.
- Tonbo Imaging partners with Indian Military
- Indian armed forces also ordered drone systems having Tonbo optical systems on board.

Tonbo Imaging

- Tonbo also makes driver vision systems for self-driving cars.
- Indian CRPF, NSG, and the Army Northern Command the prominent clients that firm deals with.
- Tonbo recently forwarded its advanced vision system products for the Indian Army’s Arjun battle tanks.

CRON System

CRON Systems is an IoT based startup, Expertise surrounding deep research in lasers, artificial intelligence, encrypted communications and automation.

Laser walls, Surveillance drones, command and control dashboard connected with encrypted communication network are some of CRON’s key enterprise offerings.

CRON System

CRON is currently working on a driverless truck, Which can be used by the army to fetch troops back after a surgical strike.

CRON announced an exclusive technology agreement with an Israeli defense robotics company, Automotive Robotic Industry Ltd(ARI).

Challenges

Cyber Attack

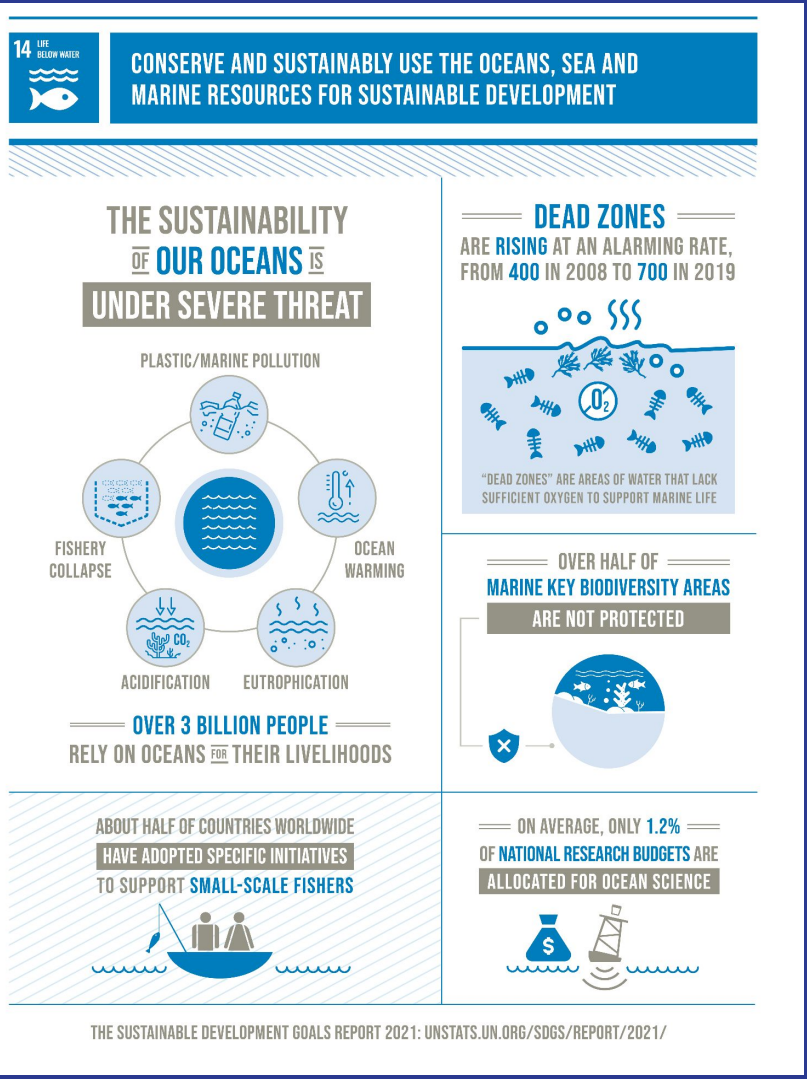
- The largest drawback of IoT technology is the serious risks in data security.

Lack of Physical Hardening

- IoT devices need to be more secured physically from threats.

Life Below Water

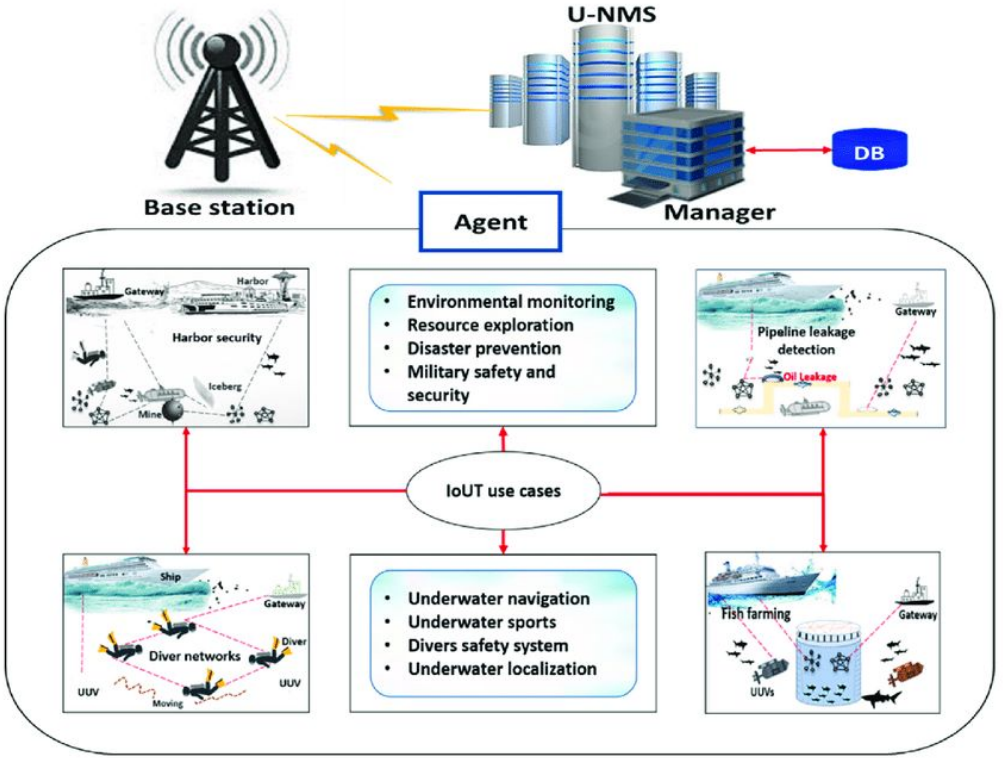
- 14 SDG



IoUT - Internet of Underwater Things

➢ IoUT use cases & applications in SDG

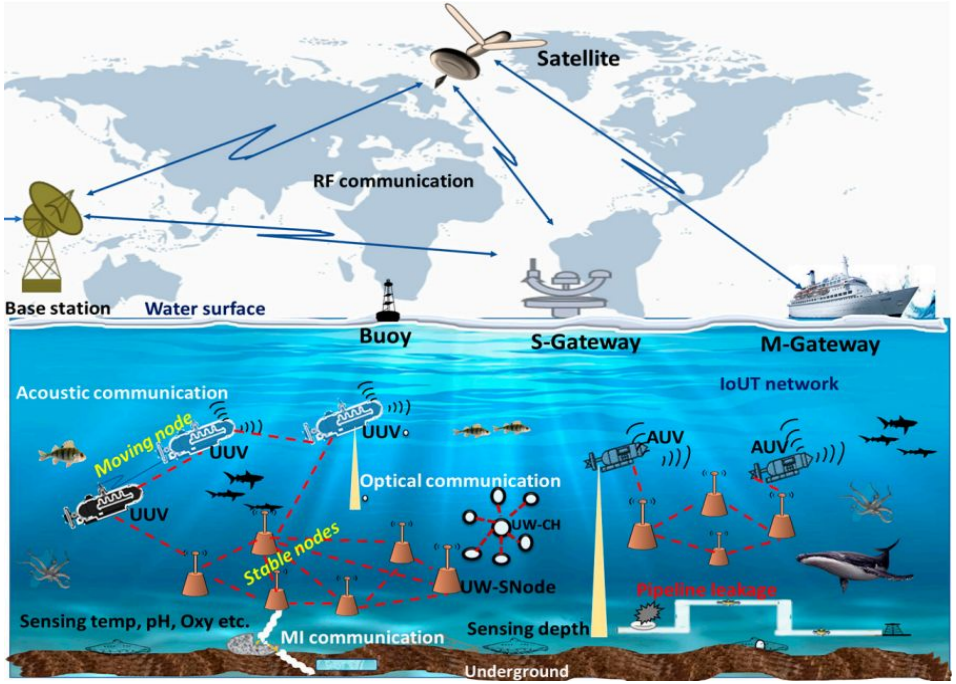
- underwater exploration
- disaster prevention
- environmental monitoring
- real-time aquatic education
- military
- archaeological expeditions



IoUT - Internet of Underwater Things

➢ IoUT Devices and Projects

- Autonomous Underwater Vehicles (AUV)
- SUNRISE project by EU (Video)



IoUT - Internet of Underwater Things

➢ Challenges for IoUT

- Signal Transmission
- Signal Interference
- Reliability
- Cost
- Chemical and UV radiation resistance

Clean Water and Sanitation

- 6 SDG

Why do we even need IoT here?

- ➔ Population Growth
  - ◆ According to a report by Mckinsey, by 2050 the population in urban areas is going to grow by three fold.
- ➔ Climate Change
  - ◆ Rising Temperatures
  - ◆ Volcanic Eruptions
- ➔ Natural Calamities
  - ◆ Around 74% of the calamities from 2001 to 2021 were water-related.
  - ◆ Contamination of fresh water resources.

❖ Above reasons force the promotion of intelligent and smart based systems to monitor, analyse and mitigate the water scarcity.

Use cases - deep-dive

Smart Water Meters

- Real time Monitoring
  - Flow
  - Pressure
  - Quality
- Collecting Data
- Analysis of the data in cloud using cloud IoT Analytics
- Based on the analytics, display it to users.

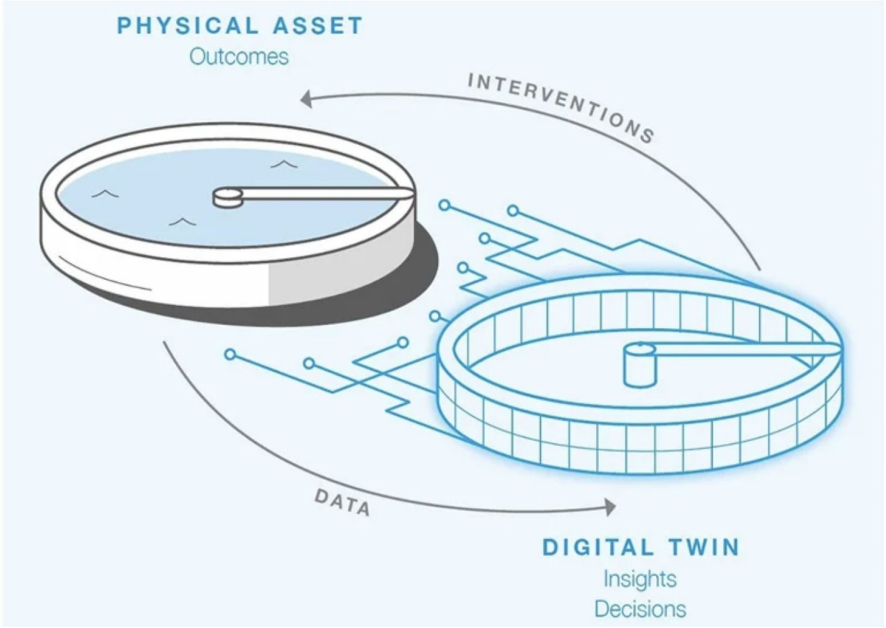
Smart Wastewater Treatment

- Cities
- Prevention of sewage overflows
- Real time Information of water level, quality.
- Based on Predefined threshold values, alerts will be sent to the governing authorities.

Use cases - deep-dive

Digital Twin

- ➔ Digital Model of the Infrastructure.
- ➔ Integration of real time data collected by IoT devices.
- ➔ Simulation of the digital infrastructure model by leveraging the predictive analysis done by AI/ML models.
- ➔ Example:- Digital Twin of Sewer management system helps to predict when overflows may be imminent.



Indian Government Initiative

Jal Jeevan Mission (JJM)

Ref : https://jaljeevanmission.gov.in/

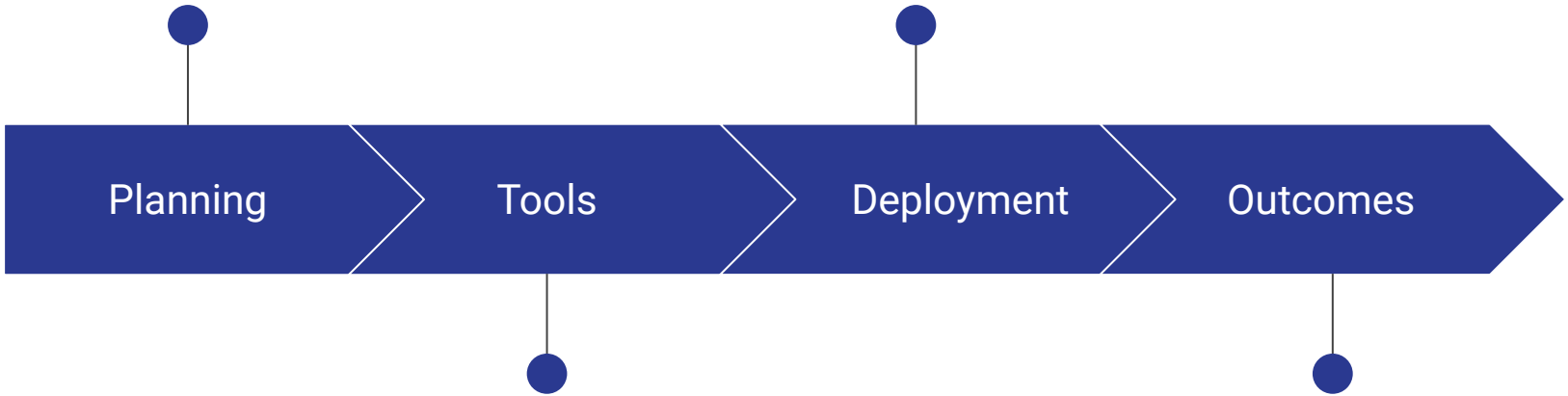
- An Initiative by Ministry of Jal Shakti in 2019.
- It’s a Union Government's flagship programme, which is implemented in partnership with States/ UTs to provide tap water connection to every rural household by 2024.
- Envisions to create a Digital Wall and Remote Command & Control Centre for monitoring.
- To supply quality water in adequate quantity (55 LPCD) every day.

Jal Jeevan Mission - Objective

- Use of (IoT) based remote monitoring that provides near real-time information without any manual intervention by using sensors.
- The collected/generated data is used to effectively monitor and manage the resources.
- Ensure real time visibility to State water supply/ PHED officials, and citizens.
- Futuristic vision to ensure regular tap water to every home.
- Enormous gains in terms of operational efficiencies, cost reduction, grievance redressal, etc.
- Data will drive improvement in service delivery and instil transparency.

Collaboration with TCIT, Tata Trust to implement pilots which had sturdy sensors.

Pilots were deployed in september 2020.



flow meters, ground water level sensors, chlorine analyzers

Distribution issues – such as outages, leakages, low pressure, etc. alerted both officials and community regarding fast depleting groundwater levels

Jal Jeevan Mission - Challenges

- Need of a Robust Solution at a fraction of the water infrastructure costs.
- CoVid-19 pandemic
- Different sensor designs were required, as the project aimed to implement the system across different terrains such as western Himalayas, Gangetic Plains, Desserts region, etc.
- Connectivity issues for IoT in rural India.
- Use of LPWAN(Low Power Wide Area Network).

A small demo :- https://ejalshakti.gov.in/jjmreport/IoTMonitoring.aspx

Role of ICT

- Introduction of IoT Technology.
- It has boosted Government’s Atma Nirbhar Bharat programme.
- Network of sensors used to collect data.
- Integration of Data with GIS(Geographical Information System).
- Monitoring and analysis using state of the art tools such as Microsoft’s Power BI.
- Further Automation is being done by integrating the analytical tools with intelligent alert systems such CAP.

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Got Any Questions?